

(1) **Oregon Coast Coho**

Final BRT Findings

<i>BRT Majority Finding</i>	<i>FEMAT Matrix: Distribution of scores</i>			<i>RISK Matrix: Average (Range)</i>			
	<i>“Endangered”</i>	<i>“Threatened”</i>	<i>Not warranted</i>	<i>Abundance</i>	<i>Productivity</i>	<i>Spatial Structure</i>	<i>Diversity</i>
<i>Likely to become endangered</i>	0	73	57	1.9 (1-3)	3.2 (2-4)	2.3 (1-3)	2.5 (2-3)

Abundance:

- 2001 and 2002 natural-origin spawners exceed number observed for several decades (projected 2002 recruitment of ~300,000 fish approaches the 30 year high of 450,000 in 1973)
- Notable natural-origin spawner increases in northern populations which were the most depressed at the time of last review
- 1997-1999 (1994-1996 brood years), however, showed (pre-harvest) recruitment failure

Productivity:

- Weak spawner:recruit relationships
- Despite positive long-term trends in spawning escapement, trends in pre-harvest recruits are negative ESU wide and for 6 of the 11 basins.

Spatial Structure:

- Habitat fragmentation by culverts and thermal barriers (~ 30% of habitat)
- Lack of response to favorable ocean conditions in smaller streams, and distinct patterns between north and south coast populations raise questions of connectivity

Diversity:

- Loss of lake habitats

Other Considerations:

- The BRT voiced concern that the apparent lack of response in recruits to harvest management during favorable ocean conditions was suggestive of other causative factors for decline
- ❖ Closures of some Oregon coastal hatchery facilities, reduction in the numbers of smolts released, improved marking rates, and efforts to include more native broodstock should reduce risks to Oregon Coast coho.

Recent Events:

- ❖ Improved hatchery practices
- Improved harvest management

(2) **Upper Columbia River Spring-run Chinook**

Final BRT Findings

<i>BRT Majority Finding</i>	<i>FEMAT Matrix: Distribution of scores</i>			<i>RISK Matrix: Average (Range)</i>			
	<i>“Endangered”</i>	<i>“Threatened”</i>	<i>Not warranted</i>	<i>Abundance</i>	<i>Productivity</i>	<i>Spatial Structure</i>	<i>Diversity</i>
<i>In danger of extinction</i>	81	65	4	4.4 (3-5)	4.5 (3-5)	2.9 (2-4)	3.5 (2-5)

Abundance:

- Precipitous decline by 1995
- Strong 2001 returns
- 2001 Methow spawners near interim recovery abundance target (2000 natural-origin spawners)
- ❖ *Supplementation programs have contributed substantially to the abundance of total natural spawners*

Productivity:

- Despite strong 2001 returns, both 5-year and long-term productivity below replacement ($\lambda < 1$)
- ❖ *Little information is available to assess the long-term impact of supplementation on productivity*

Spatial Structure:

- The construction of Chief Joseph and Grand Coulee Dams resulted in the extirpations of six stocks in the upper basin.
- Passage/connectivity remains among extant subpopulations (but for Icicle Cr.)
- ❖ *In 1996 and 1998 all returns to the Methow were collected at downstream dams into the supplementation program, generating concerns over the preservation of subpopulation structure and diversity*

Diversity:

- ❖ *All hatchery programs presently in ESU are for supplementation*
- ❖ *Straying of hatchery-origin adults into natural production areas in the Wenatchee and Entiat Rivers is thought to be low*
- ❖ *Some years there are high rates of straying into the Entiat (Ford)*

(3) **Hood Canal Summer-run Chum**
Final BRT Findings

<i>BRT Majority Finding</i>	<i>FEMAT Matrix: Distribution of scores</i>			<i>RISK Matrix: Average (Range)</i>			
	<i>“Endangered”</i>	<i>“Threatened”</i>	<i>Not warranted</i>	<i>Abundance</i>	<i>Productivity</i>	<i>Spatial Structure</i>	<i>Diversity</i>
<i>Likely to become endangered</i>	25	89	6	3.7 (3-4)	3.4 (2-4)	3.7 (3-5)	3.5 (2-4)

Abundance:

- Recent upturns in abundance
- Most populations remain depressed
- 2 of 9 remaining populations above co-managers conservation threshold
- ❖ Abundance estimates complicated by an uncertain hatchery fraction for some streams
- ❖ Hatchery fish exceed 60% for some populations, indicating that reintroduction programs are supplementing the numbers of total fish spawning naturally in streams.
- ❖ Recent increases in abundance likely reflect the influence of supplementation programs in some streams and improved ocean conditions

Productivity:

- All but 2 populations with a productivity below replacement ($\lambda < 1$) over the past 5 years
- ❖ Marking of hatchery-origin fish has been initiated only recently for many programs, complicating assessments of productivity.
- ❖ Supplementation efforts appear to be resulting in natural-origin returns in some streams (e.g., Big and Little Quilcene Rivers)

Spatial Structure:

- 7 of 16 historical populations in the ESU have been extirpated.
- Loss of estuary and lower floodplain habitats
- ❖ Several of the putatively extirpated populations (esp. on the eastern side of Hood Canal) are the focus of an extensive rebuilding program including hatchery supplementation and reintroductions.

Diversity:

- ❖ Small numbers of marked Quilcene hatchery fish collected in other streams indicate that some straying may be occurring. However, with the extirpation of many local populations, much of this historical structure has been lost, and the use of Quilcene hatchery fish may represent one of few remaining conservation options

Other Considerations:

- Improvements in harvest management since 1990s
- Predation by marine mammals

(4) **Central California Coast *O. mykiss***

Final BRT Findings

<i>BRT Majority Finding</i>	<i>FEMAT Matrix: Distribution of scores</i>			<i>RISK Matrix: Average (Range)</i>			
	<i>“Endangered”</i>	<i>“Threatened”</i>	<i>Not warranted</i>	<i>Abundance</i>	<i>Productivity</i>	<i>Spatial Structure</i>	<i>Diversity</i>
<i>Likely to become endangered</i>	40	111	9	3.9 (3-5)	3.9 (3-5)	3.6 (2-5)	2.8 (2-4)

Abundance:

- Information on abundance is limited in this ESU. There are no timeseries of population abundance for the ESU.
- Data for the population in the ESU’s largest river system (Russian R.) may indicate seven-fold decline since the mid-1960s, although abundance appears to be more stable in other systems.
- Available information consists of juvenile densities for 5 “representative” populations each exhibits declines over the 8 years of available data.

Productivity:

- All 5 juvenile density data series exhibit negative trends over the last 8 years.

Spatial Structure:

- Juvenile *O. mykiss* have been observed in approximately 82% of historically occupied streams, indicating that the ESU remains spatially widespread
- Impassible dams have cut off substantial portions of spawning habitat in some basins.

Diversity:

- SWFSC genetic analyses indicate the 15 of 16 populations sampled indicate a recent bottleneck.

Resident *O. mykiss*

- For some BRT members the presence of abundant resident populations reduces risks to ESU abundance, but provides uncertain contribution to productivity, spatial structure, and diversity is uncertain.

Recent Events

- Harvest impacts have been substantially reduced since the last status review.

(5) **Central California Coast coho**

Final BRT Findings

<i>BRT Majority Finding</i>	<i>FEMAT Matrix: Distribution of scores</i>			<i>RISK Matrix: Average (Range)</i>			
	<i>“Endangered”</i>	<i>“Threatened”</i>	<i>Not warranted</i>	<i>Abundance</i>	<i>Productivity</i>	<i>Spatial Structure</i>	<i>Diversity</i>
<i>In danger of extinction</i>	96	34	0	4.8 (3-5)	4.5 (4-5)	4.7 (4-5)	3.6 (2-5)

Abundance:

- Information on abundance is extremely limited in this ESU. There are no time series of spawner abundance for individual river systems.
- Historical point estimates of abundance indicate low contemporary abundance.
- Analyses of presence-absence information, juvenile density surveys, and infrequent adult counts on the S. Fork Noyo River indicate low abundance levels and downward trends throughout the ESU.
- An increased observed presence of coho in historically occupied streams in the northern portion of the ESU for 2001 is believed to reflect favorable ocean conditions and stream flows, and increased harvest restrictions.
- Data are particularly lacking for many river basins in the southern two-thirds of the ESU where populations are considered to be at the greatest risk.

Productivity:

- Information on population growth rates is extremely limited in this ESU

Spatial Structure:

- Coho are believed to be extirpated or nearly so in several major river basins in the southern portion of the ESU, resulting in poor connectivity among ESU populations

Diversity:

- ❖ Artificial propagation has been reduced in the ESU since the 1996 ESA listing.
- ❖ Genetic diversity risks associated with out-of-basin transfers appear to be minimal, but risks from domestication selection and low effective population sizes in the remaining hatchery programs remains a concern.
- ❖ Natural returns often too low for collection of natural broodstock (Monterrey Bay Salmon and Trout Project). A captive program has been initiated at SWFSC (Scott Creek) to bolster MBSTP numbers. Initiated since BRT
- ❖ Russian River captive broodstock program possibly represents a pooling of divergent stocks. Broodstock source has been changed informed by more recent genetic work that has identified a local tributary population vs. spawning aggregations that appear to be comprised of divergent stocks.

(6) **Lake Ozette Sockeye**

Final BRT Findings

<i>BRT Majority Finding</i>	<i>FEMAT Matrix: Distribution of scores</i>			<i>RISK Matrix: Average (Range)</i>			
	<i>“Endangered”</i>	<i>“Threatened”</i>	<i>Not warranted</i>	<i>Abundance</i>	<i>Productivity</i>	<i>Spatial Structure</i>	<i>Diversity</i>
<i>Likely to become endangered</i>	21	91	18	3.7 (3-4)	3.5 (3-4)	3.8 (3-5)	3.0 (2-4)

Abundance:

- Considerable uncertainty with abundance data series
- Initiation of video sampling, bias adjustments in progress
- ❖ Abundance estimates complicated by an uncertain hatchery fraction
- ❖ Makah Fisheries hatchery supplementation program initiated 1983 in Umbrella Creek and Big River
- ❖ Total returns to Umbrella Creek average ~ 10% of the total Lake Ozette run size.
- ❖ Limited marking of Umbrella Creek hatchery fish indicates that the supplementation program has resulted in some natural-origin spawners (i.e., 149 in 1999)

Productivity:

- ❖ Productivity estimates complicated by an uncertain hatchery fraction

Spatial Structure:

- Loss of numerous beach spawning sites
- ❖ Otolith marking of hatchery fish and carcass retrievals indicate that straying of tributary hatchery fish to beach spawning sites is very low.

Diversity:

- The single Lake Ozette population represents the entire ESU
- Reduction in number of lake spawning aggregations
- ❖ Otolith marking of hatchery fish and carcass retrievals indicate that straying of tributary hatchery fish to beach spawning sites is very low.

Other Considerations:

- Pre-spawning predation by harbor seals and river otters
- Non-native fish species
- Significant sedimentation from adjacent logging activities

Recent Events:

- Improved abundance sampling since 1998

(7) **Puget Sound Chinook**

Final BRT Findings

<i>BRT Majority Finding</i>	<i>FEMAT Matrix: Distribution of scores</i>			<i>RISK Matrix: Average (Range)</i>			
	<i>“Endangered”</i>	<i>“Threatened”</i>	<i>Not warranted</i>	<i>Abundance</i>	<i>Productivity</i>	<i>Spatial Structure</i>	<i>Diversity</i>
<i>Likely to become endangered</i>	12	111	27	3.3 (2-4)	3.6 (3-4)	2.9 (2-4)	3.2 (2-4)

Abundance:

- Most populations < 1500 natural spawners (except Skagit ~ 10,000 fish)
- All populations below Shared Strategy’s preliminary planning targets
- ❖ Abundance estimates complicated by unmarked hatchery fish and an uncertain hatchery fraction for 10 of 22 populations

Productivity:

- More populations (13 v. 9) showed increases in escapement in recent years
- Only 36% of populations with long-term productivity above replacement ($\lambda > 1$)
- Only 23% of populations with recent 5- year productivity above replacement ($\lambda > 1$)
- ❖ Productivity estimates complicated by uncertain hatchery fraction in many streams

Spatial Structure:

- Non-uniform distribution of extinction risk among populations (concentration of natural production in just a few basins)
- ~70% loss of estuary and side-channel habitats

Diversity:

- Disproportionate loss of early run populations (only 3-5 “spring” populations remain)
- ❖ ESU-wide, hatchery fraction of spawners remains high (~ 70%)
- ❖ Hatchery managers slow to move toward conservation hatchery model and incorporation of local broodstock
- ❖ Pervasive use of transplanted Green R. stock
- Overall harvest impacts much improved, although still high in some areas

(8) **Lower Columbia River Coho**

Final BRT Findings

<i>BRT Majority Finding</i>	<i>FEMAT Matrix: Distribution of scores</i>			<i>RISK Matrix: Average (Range)</i>			
	<i>“Endangered”</i>	<i>“Threatened”</i>	<i>Not warranted</i>	<i>Abundance</i>	<i>Productivity</i>	<i>Spatial Structure</i>	<i>Diversity</i>
<i>In danger of extinction</i>	88	42	0	4.4 (4-5)	4.2 (3-5)	4.2 (2-5)	4.5 (4-5)

Abundance:

- Few natural spawners in Sandy and Clackamas (combined abundance ~2,000-5,000)
- 2000 and 2001 with moderately improved natural-origin returns
- Through 1980’s and 1990’s the lower tributaries lacked spawners, however, a few spawners of unknown origin have been surveyed in 2000-2001
- ❖ > 1,000,000 hatchery returns in 2001
- ❖ 2002 hatchery returns ~ 600,000

Productivity:

- Despite recent upturns, short- and long-term trends are < 1
- Productivity below replacement ($\lambda < 1$)
- 5 of the last 10 years there has been recruitment failure in the Sandy R. population
- Populations are exhibiting a poor response to harvest reductions

Spatial Structure:

- Of 25 historical populations, only 2 (small) natural populations are extant
- ~ 40% loss/blockage of historical habitat
- Poor population connectivity
- ❖ Large scale of hatchery production

Diversity:

- Small population sizes
- ❖ Predominance of hatchery fish relative to natural production
- ❖ A substantial proportion of the remaining genetic resources in the ESU reside in the hatchery programs

(9) **Sacramento River winter-run chinook**

Final BRT Findings

<i>BRT Majority Finding</i>	<i>FEMAT Matrix: Distribution of scores</i>			<i>RISK Matrix: Average (Range)</i>			
	<i>“Endangered”</i>	<i>“Threatened”</i>	<i>Not warranted</i>	<i>Abundance</i>	<i>Productivity</i>	<i>Spatial Structure</i>	<i>Diversity</i>
<i>In danger of extinction</i>	71	46	3	3.7 (3-5)	3.5 (2-5)	4.8 (4-5)	4.2 (3-5)

Abundance:

- The ESU has exhibited marked improvements in abundance in recent years.
- The recent 5-year mean total abundance (2,191 fish), are very encouraging representing substantial increases since the 1990s. However, current abundance represents <3% of the post-1967 peak (approx. 100k).

Productivity:

- No time series are suitable for analysis of trends or estimation of population growth rates

Spatial Structure:

- The ESU is represented by a single extant population that has been displaced completely from its historical spawning habitat by the establishment of the Shasta Dam. The remaining spawning habitat is artificially maintained by cold-water releases from the Shasta reservoir.

Diversity:

- The construction of Shasta Dam likely merged several independent winter-run populations into a single population, representing a substantial loss to genetic diversity, life-history variability, and local adaptation.
- Episodes of critically low abundance (below 200 fish in the 1990s) for the single remaining population have imposed further “bottlenecks” reducing genetic diversity.
- ❖ The Livingston Stone National Fish hatchery was initiated in 1997 with the sole purpose of restoring natural production of Sacramento River winter-run Chinook, and preserving remaining genetic diversity. Strict broodstock practices are aimed at conserving genetic diversity while not adversely impacting the naturally spawning population.

Recent Events

- Harvest impacts have been substantially reduced since the last status review.

(10) **California Coastal chinook**

Final BRT Findings

<i>BRT Majority Finding</i>	<i>FEMAT Matrix: Distribution of scores</i>			<i>RISK Matrix: Average (Range)</i>			
	<i>“Endangered”</i>	<i>“Threatened”</i>	<i>Not warranted</i>	<i>Abundance</i>	<i>Productivity</i>	<i>Spatial Structure</i>	<i>Diversity</i>
<i>Likely to become endangered</i>	36	100	13	3.9 (3-5)	3.3 (3-4)	3.2 (2-4)	3.1 (2-4)

Abundance:

- Uncertainty in abundance due to limited availability of data
- Available data are of varying type, quality and temporal coverage and not generally amenable to abundance and trend analyses.
- Information indicates that abundance levels remain depressed (relative to historical levels)
- Available estimates of recent mean total abundance (Freshwater Creek, Mad River, Eel River tributaries) are < 100 fish.
- The source of increases in Russian River total returns (>1,300 returns) for 2000-2002 is uncertain, and may represent natural production or straying from out-of-basin or out-of-ESU fish. No genetic information to assess their relationship to this or other ESUs is available.
- ❖ Artificially propagated fish likely represent a small proportion of ESU total returns. In general hatchery programs in this ESU are not oriented toward large-scale production, but rather are small-scale operations oriented at supplementing depressed populations.

Productivity:

- No time series are suitable for analysis of trends or estimation of population growth rates

Spatial Structure:

- Uncertainty in the spatial distribution of populations due to limited availability of data
- Large extents of coastline watershed believed to be too small to support independent populations
- Reduction in geographic distribution, particularly for spring-run chinook salmon and for basins in the southern portion of the ESU’s range.

Diversity:

- Loss of spring-run life history in Eel River basin and elsewhere in the ESU

(11) **Northern California *O. mykiss***

Final BRT Findings

<i>BRT Majority Finding</i>	<i>FEMAT Matrix: Distribution of scores</i>			<i>RISK Matrix: Average (Range)</i>			
	<i>“Endangered”</i>	<i>“Threatened”</i>	<i>Not warranted</i>	<i>Abundance</i>	<i>Productivity</i>	<i>Spatial Structure</i>	<i>Diversity</i>
<i>Likely to become endangered</i>	18	119	23	3.7 (3-5)	3.3 (4-5)	2.2 (1-4)	2.5 (1-4)

Abundance:

- There is little historical abundance information for this ESU, however available data (dam counts on the Eel and Mad Rivers) indicate a dramatic decline from the abundance levels of the 1930s.
- The three available summer steelhead data sets exhibit recent 5-year mean abundance levels from 3 to 418 adults.

Productivity:

- The short- and long-term abundance trends for the one winter steelhead data series show a slightly positive trend, however, the 5-year mean abundance level is extremely low (32 adults).
- Juvenile density data for 6 of 10 (putative) independent populations exhibit declining trends.

Spatial Structure:

- *O. mykiss* appears to still be widely distributed in this ESU

Diversity:

- Low effective population sizes in this ESU are of concern.
- ❖ Interactions with out-of-ESU Mad River Hatchery stock represent a risk to ESU diversity

Resident *O. mykiss*

- The BRT did not consider the resident fish to reduce risks to ESU abundance, and their contribution to productivity, spatial structure, and diversity is uncertain.

Recent Events

- Harvest impacts have been substantially reduced since the last status review.

(12) **California Central Valley *O. mykiss***

Final BRT Findings

BRT Majority Finding	FEMAT Matrix: Distribution of scores			RISK Matrix: Average (Range)			
	“Endangered”	“Threatened”	Not warranted	Abundance	Productivity	Spatial Structure	Diversity
<i>In danger of extinction</i>	106	54	0	4.4 (4-5)	4.3 (3-5)	4.2 (2-5)	3.6 (2-5)

Abundance:

- Little information is available regarding the abundance of this ESU
- Extrapolated abundance estimates from outmigrating juveniles indicate that on average (1998-2000) there were approximately 3,600 spawning female steelhead. This can be compared to estimates of 1-2 million spawners before 1850, and 40,000 spawners in the 1960s.
- Anadromous *O. mykiss* above RBDD show small population size (recent 5-year mean less than 2,000 adults), and exhibit strongly negative trends in abundance.
- The recent 5-year mean total abundance (2,191 fish), are very encouraging representing substantial increases since the 1990s. However, current abundance represents <3% of the post-1967 peak (approx. 100k).

Productivity:

- Anadromous returns *O. mykiss* above RBDD exhibit a strongly negative population growth rate

Spatial Structure:

- *O. mykiss* remain widely distributed in Sacramento River tributaries, however, *O. mykiss* have been extirpated throughout the vast majority (approx. 95%) of historical spawning areas that are currently above impassible dams.

Diversity:

- ❖ The significant production of out-of-ESU hatchery steelhead by the Nimbus Hatchery and Mokelumne River Hatchery pose risks to ESU diversity.

Resident *O. mykiss*

- For some BRT members the presence of abundant resident populations reduces risks to ESU abundance, but provides uncertain contribution to productivity, spatial structure, and diversity is uncertain.

Recent Events

- Harvest impacts have been substantially reduced since the last status review.

(13) **Southern Oregon/Northern California Coast Coho**

Final BRT Findings

<i>BRT Majority Finding</i>	<i>FEMAT Matrix: Distribution of scores</i>			<i>RISK Matrix: Average (Range)</i>			
	<i>“Endangered”</i>	<i>“Threatened”</i>	<i>Not warranted</i>	<i>Abundance</i>	<i>Productivity</i>	<i>Spatial Structure</i>	<i>Diversity</i>
<i>Likely to become endangered</i>	29	87	14	3.8 (2-5)	3.5 (2-5)	3.1 (2-4)	2.8 (2-4)

Abundance:

- Rogue R. returns > 10000 natural spawners in 2000 and 2001
- Rogue R. 5-year geom. mean abundance ~ 5000 is highest for data series
- ❖ Estimates of hatchery fraction of natural spawners averages 2-20%, with most concentrated in the mainstem and few observed in tributaries.
- Paucity of CA data
- Few index counts available show high variability and no apparent trend
- Presence/absence analyses suggest ~50% of historical streams are currently occupied (3 yr mean)

Productivity:

- Short- and long-term spawner trends are upward, however trends in recruits are flat
- Rogue R. recent 5-year productivity above replacement
- ❖ Hatchery fraction estimates are unavailable for most years, precluding evaluations of lambda over the timeseries
- CDFG presence/absence analysis concludes continued declines in streams occupied, inferring declining populations

Spatial Structure:

- Loss of historical population structure

Diversity:

- ❖ Concerns with CA hatchery straying and broodstock practices, although notable improvements and hatchery closures in recent years
- ❖ Concern over the high stray rates of Iron Gate hatchery fish

Recent Events:

- 2001 low water year in Klamath
- 2002 drought and fish kill in lower Klamath (estimated 30% mortality of coho run)
- ❖ Termination of several category 3-4 coho hatcheries (e.g., Rowdy Cr., Prairie Cr., Mad R.)

(14) **Upper Willamette River Chinook**

Final BRT Findings

<i>BRT Majority Finding</i>	<i>FEMAT Matrix: Distribution of scores</i>			<i>RISK Matrix: Average (Range)</i>			
	<i>“Endangered”</i>	<i>“Threatened”</i>	<i>Not warranted</i>	<i>Abundance</i>	<i>Productivity</i>	<i>Spatial Structure</i>	<i>Diversity</i>
<i>Likely to become endangered</i>	32	105	13	3.7 (2-5)	3.1 (2-5)	3.6 (3-4)	3.2 (2-4)

Abundance:

- Fraction of historical abundance
- Until recently, there were dam counts only and no direct spawner estimates;
- ❖ High hatchery fraction (historically ~ 60% of escapement), only recently distinguishable
- ❖ Total abundance (hatchery plus natural origin) has increased in the last couple of years
- ❖ Natural-origin spawners continue to be outnumbered by hatchery origin-spawners in most populations.

Productivity:

- Improving trend since 1995

Spatial Structure:

- ~ 30-40% of historical habitat blocked by dams
- Natural production restricted to just a few areas, predominantly in the McKenzie River.

Diversity:

- ❖ Loss of local adaptation through homogenization of hatchery stocks within ESU and high proportion of hatchery spawners
- ❖ Introgression of hatchery fall-run chinook

Recent Events:

- ❖ Cessation of fall-run hatchery
- ❖ Improved marking of hatchery fish and switch to a marked-fish selective fishery

(15) **Columbia River Chum**

Final BRT Findings

<i>BRT Majority Finding</i>	<i>FEMAT Matrix: Distribution of scores</i>			<i>RISK Matrix: Average (Range)</i>			
	<i>“Endangered”</i>	<i>“Threatened”</i>	<i>Not warranted</i>	<i>Abundance</i>	<i>Productivity</i>	<i>Spatial Structure</i>	<i>Diversity</i>
<i>Likely to become endangered</i>	44	74	2	3.6 (3-4)	3.5 (2-4)	4.6 (4-5)	3.9 (3-5)

Abundance:

- Abundance remained low (2000-4000) during 1980’s and 1990’s
- Unofficial 2002 reports suggest large increases in abundance at several locations (~20,000).
- ❖ Grays River chum hatchery program (est. 1999) confounds abundance estimates as hatchery fish are included in the 2002 abundance.

Productivity:

- Productivity over recent years at or below replacement (but for 2002)
- Uncertain cause of large 2002 reported returns

Spatial Structure:

- Approximately 90% of historic populations in ESU are extirpated
- Loss of off-channel habitat and spawning sites

Diversity:

- Loss of connectivity due to population extirpations
- Loss of off-channel areas
- Only 3 extant populations of 17 historical populations

Other Considerations:

- Negative interactions with hatchery releases of yearling steelhead/chinook/coho

Recent Events:

- Improved management of incidental harvest
- Improved flow management at Bonneville Dam for lower Columbia River Gorge populations
- ❖ Initiation of Grays River supplementation program with first returns in 2002

(16) **Lower Columbia River *O. mykiss***

Final BRT Findings

<i>BRT Majority Finding</i>	<i>FEMAT Matrix: Distribution of scores</i>			<i>RISK Matrix: Average (Range)</i>			
	<i>“Endangered”</i>	<i>“Threatened”</i>	<i>Not warranted</i>	<i>Abundance</i>	<i>Productivity</i>	<i>Spatial Structure</i>	<i>Diversity</i>
<i>Likely to become endangered</i>	10	110	30	3.3 (2-5)	3.3 (3-4)	2.7 (2-4)	3.0 (2-4)

Abundance:

- Most populations show arrested declines or increased abundances in 2000-2002
- ❖ Hatchery-origin fish represent a substantial fraction of natural spawners in many populations.
- ❖ Populations with few naturally spawning hatchery fish have very low recent mean abundance estimates (e.g., 726, 196, and 504 for the Kalama, North Fork Toutle, and South Fork Toutle River winter-run populations, respectively)

Productivity:

- Long-term trends in spawners are negative for all populations but one small population (NF Toutle)
- Only 1-3 of 9 populations for which there is data have short-term productivity above replacement (depending upon assumptions about the contribution of hatchery fish to natural production)
- ❖ Hatchery fraction data is lacking for many populations generating uncertainty in productivity estimates

Spatial Structure:

- 4 historical populations are extinct, and only half of 23 historical populations exhibit natural production

Diversity:

- Declines and extirpations disproportionately affect the summer steelhead life history
- ❖ High proportion of hatchery-origin natural spawners

Recent Events:

- ❖ Improved hatchery practices in Sandy R.

(17) **Lower Columbia River Chinook**

Final BRT Findings

<i>BRT Majority Finding</i>	<i>FEMAT Matrix: Distribution of scores</i>			<i>RISK Matrix: Average (Range)</i>			
	<i>“Endangered”</i>	<i>“Threatened”</i>	<i>Not warranted</i>	<i>Abundance</i>	<i>Productivity</i>	<i>Spatial Structure</i>	<i>Diversity</i>
<i>Likely to become endangered</i>	25	107	19	3.2 (2-4)	3.7 (3-5)	3.5 (3-4)	3.9 (3-5)

Abundance:

- ❖ Estimates of natural spawning uncertain, with ~ 70% hatchery fraction and only 1-2% marking of hatchery fish.
- ❖ The majority of the fall-run tule populations have a substantial fraction of hatchery-origin spawners and may be sustained largely by hatchery production.
- Population abundances show variable response to recent favorable ocean conditions

Productivity:

- For all populations except for one, long-term productivity below replacement ($\lambda < 1$)
- ~63% of the populations exhibit short-term (5-year) productivity below replacement
- ❖ Evaluating trends and productivity is complicated by low marking rates of hatchery production and the general lack of information on hatchery fraction

Spatial Structure:

- ~22 of 31 historic populations extant

Diversity:

- Most of extirpated populations are spring-run, few remaining spring-run populations as dams block their higher elevation spawning habitat
- ❖ Artificial propagation of spring-run stocks is often no in watersheds that historically supported the spring-run life history (e.g., Sandy & Kalama Rivers)
- ❖ Almost all current spring-run spawners in the ESU are of hatchery origin.
- ❖ Artificial propagation practices are homogenizing spring and fall life histories
- ❖ Introgression of hatchery Rogue R. brights from Young’s Bay

(18) **Upper Columbia River *O. mykiss***

Final BRT Findings

*FEMAT Matrix:
Distribution of scores*

*RISK Matrix:
Average (Range)*

<i>BRT Majority Finding</i>	<i>“Endangered”</i>	<i>“Threatened”</i>	<i>Not warranted</i>	<i>Abundance</i>	<i>Productivity</i>	<i>Spatial Structure</i>	<i>Diversity</i>
<i>In danger of extinction</i>	75	62	3	3.5 (2-4)	4.3 (3-5)	3.1 (2-4)	3.6 (2-5)

Abundance:

- Improved abundances of natural-origin returns in 2001-2002
- Current natural abundances 14-30% of interim recovery targets, **although an uncertain fraction is composed of hatchery-origin returns.**
- ❖ Hatchery-origin returns predominate the estimated escapement in the Wenatchee (65%), and the Methow and Okanogan Rivers (85%).
- ❖ Supplementation programs have contributed substantially to the abundance of total natural spawners in recent years

Productivity:

- Recent population trends show 6-13% increases
- Long-term trends remain highly negative
- ❖ Within-ESU hatchery programs are designed specifically to supplement natural production.
- ❖ No direct information is available regarding the effectiveness of hatchery spawners relative to their natural counterparts.
- ❖ Little information is available to assess the long-term impact of high levels of supplementation on productivity.

Spatial Structure:

- Population fragmentation
- ❖ Carcass surveys in the upper Wenatchee and Entiat Rivers indicate that the stray rates from downstream hatchery facilities low.

Diversity:

- Declines in anadromous life-history form
- ❖ The long-term effect of accelerated spawn timing in hatchery-origin fish on the ESU is uncertain.
- ❖ The long-term effect of such high levels of hatchery supplementation on the ESU is uncertain.
- ❖ Concern over genetic homogenization due to hatchery supplementation.
- ❖ Approx. 10% of Methow Composite hatchery’s “natural” broodstock composed of unmarked hatchery fish

(19) **Snake River Fall-run Chinook**
Final BRT Findings

<i>BRT Majority Finding</i>	<i>FEMAT Matrix: Distribution of scores</i>			<i>RISK Matrix: Average (Range)</i>			
	<i>“Endangered”</i>	<i>“Threatened”</i>	<i>Not warranted</i>	<i>Abundance</i>	<i>Productivity</i>	<i>Spatial Structure</i>	<i>Diversity</i>
<i>Likely to become endangered</i>	38	91	21	3.4 (2-5)	3.0 (2-5)	3.6 (2-5)	3.5 (2-5)

Abundance:

- 2001 natural returns (2652 adults) up markedly from last 10 years (< 1000 adults/yr); highest on record since 1975.
- 2001 natural returns > interim recovery target of 2500 natural spawners for the ESU. Recent 5-year geometric mean abundance remains 35% of this interim recovery target.
- ❖ Estimates of natural-origin abundance complicated by the hatchery production of unmarked sub-yearling fall chinook.
- ❖ 2001 total returns (8700 hatchery + natural adults) is in the range of the estimated potential capacity of the area
- ❖ Recent returns attributable to increased Lyons Ferry Hatchery (unmarked) sub-yearling and (marked) yearling releases and relatively high marine survival rates

Productivity:

- Long-term and short-term trends in natural returns per spawner are positive, depending upon assumptions regarding the contribution of hatchery fish
- Trends reflect (presumably) PDO/strong ocean conditions
- ❖ Estimates of natural-origin productivity complicated by the hatchery production of unmarked sub-yearling fall chinook.

Spatial Structure:

- ESU comprise of only one population
- Loss of ~80% historical spawning habitat
- Considerable loss of habitat diversity

Diversity:

- ❖ Improvements in marking and management of non-ESU Umatilla (Priest Rapids stock) strays
- ❖ Concern that hatchery egg collection below Lower Granite Dam incorporates non-ESU strays

Recent Events:

- Improved flow regime pursuant to FCRPS 2000 BiOp
- Improved management of ocean harvest

(20) **Snake River Sockeye**

Final BRT Findings

<i>BRT Majority Finding</i>	<i>FEMAT Matrix: Distribution of scores</i>			<i>RISK Matrix: Average (Range)</i>			
	<i>“Endangered”</i>	<i>“Threatened”</i>	<i>Not warranted</i>	<i>Abundance</i>	<i>Productivity</i>	<i>Spatial Structure</i>	<i>Diversity</i>
<i>In danger of extinction</i>	<i>130</i>	<i>0</i>	<i>0</i>	<i>5.0</i>	<i>5.0</i>	<i>4.9 (4-5)</i>	<i>5.0</i>

Abundance:

- ~ 16 naturally produced adults in the last decade
- ❖ Captive broodstock program initiated in 1991 has provided a short-term safety net from extinction
- ❖ Return of 257 hatchery adults in 2000, while hatchery returns in 2000 and 2001 ~ 25

Productivity:

- Natural population trends are not encouraging

Spatial Structure:

- Historically occurred in 4 lakes within the Stanley Basin
- Redfish Lake is the only extant population

Diversity:

- Residual-type sockeye in Redfish Lake
- Possible remnant gene pools in Stanley and Petit Lakes

(21) **Snake River Spring/Summer-run Chinook**

Final BRT Findings

<i>BRT Majority Finding</i>	<i>FEMAT Matrix: Distribution of scores</i>			<i>RISK Matrix: Average (Range)</i>			
	<i>“Endangered”</i>	<i>“Threatened”</i>	<i>Not warranted</i>	<i>Abundance</i>	<i>Productivity</i>	<i>Spatial Structure</i>	<i>Diversity</i>
<i>Likely to become endangered</i>	30	102	18	3.6 (2-5)	3.5 (3-5)	2.2 (1-3)	2.3 (1-3)

Abundance:

- Marked increase in 2001 returns for many natural populations
- 88% of the total spring-run comprised of hatchery-origin returns
- 2001 returns for 2 populations encouraging ~ interim recovery target levels
- Remaining populations far below their respective interim targets

Productivity:

- Long term trends << 1
- Recent trends, buoyed by last two years, are approaching 1

Spatial Structure:

- Widely distributed; much of historic habitat still available (~90%)

Diversity:

- Much habitat diversity remains
- ❖ No evidence of wide-scale straying by hatchery populations.
- ❖ Improved marking and removal of Rapid River stock hatchery fish has reduced straying into natural spawning areas.

Recent Events:

- ❖ Phasing out of Rapid River hatchery stock in the Grande Ronde
- Improved management of Columbia R. fishery

(22) **Snake River Basin *O. mykiss***

Final BRT Findings

<i>BRT Majority Finding</i>	<i>FEMAT Matrix: Distribution of scores</i>			<i>RISK Matrix: Average (Range)</i>			
	<i>“Endangered”</i>	<i>“Threatened”</i>	<i>Not warranted</i>	<i>Abundance</i>	<i>Productivity</i>	<i>Spatial Structure</i>	<i>Diversity</i>
<i>Likely to become endangered</i>	14	103	23	3.1 (2-4)	3.2 (2-4)	2.5 (1-4)	3.1 (2-4)

Abundance:

- Mixed trends in abundance
- Uncertainty given paucity of data for adult spawners
- ❖ Available information confounded by high but uncertain fraction of hatchery-origin natural spawners
- Dam counts are currently 28% of the interim recovery target for the Snake River Basin (52,000 natural spawners)
- Joseph Cr. exceeds interim recovery target

Productivity:

- Mixed long- and short-term trends in productivity

Spatial Structure:

- Populations remain in 6 major geographic areas

Diversity:

- B-run steelhead particularly depressed
- ❖ Displacement of natural fish by hatchery fish (declining proportion of natural-origin spawners)
- ❖ Homogenization of hatchery stocks within basins, and some stocks exhibiting high stray rates

Recent Events:

- ❖ Hatchery reform with increased use of local broodstock, and hatchery releases away from areas of natural production

(23) **Middle Columbia River *O. mykiss***

Final BRT Findings

<i>BRT Majority Finding</i>	<i>FEMAT Matrix: Distribution of scores</i>			<i>RISK Matrix: Average (Range)</i>			
	<i>“Endangered”</i>	<i>“Threatened”</i>	<i>Not warranted</i>	<i>Abundance</i>	<i>Productivity</i>	<i>Spatial Structure</i>	<i>Diversity</i>
<i>Likely to become endangered</i>	<i>1</i>	<i>71</i>	<i>68</i>	<i>2.7 (2-4)</i>	<i>2.6 (2-3)</i>	<i>2.6 (2-4)</i>	<i>2.5 (2-4)</i>

Abundance:

- Large ESU-wide abundance increases 2000-2002
- Deschutes natural-origin return is in excess of interim recovery abundance target, **although estimate includes an unknown fraction of unmarked out-of-ESU strays**. An uncertain, but potentially significant, fraction of strays may be “dip ins” that migrate out of the Deschutes prior to spawning.
- Upper John Day natural-origin abundance in excess of their interim recovery targets
- Umatilla nearing its interim recovery target, **although the hatchery fraction is uncertain**
- Yakima (major drainage and historical production center) only 10% of interim recovery targets

Productivity:

- Long-term productivity is below replacement for 66% (8/12) of populations
- Short-term productivity is below replacement for 42% (5/12) of populations
- ❖ **Estimates of productivity complicated by unknown hatchery fractions, and unknown contributions of out-of-ESU strays**

Spatial Structure:

- Conduit Dam blocks access to all but 2-3 miles of spawning habitat in the Big White Salmon River.
- Historical production center (Yakima R.) still depressed

Diversity:

- ❖ **Unknown what proportion of natural spawners are out-of-ESU strays**